Tsunamis in the Puget Sound Region: A New Program

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A program is underway to better understand and predict the tsunami threat in the Puget Sound Region. In the Strait of Juan de Fuca, tsunamis generated by earthquakes in the Cascadia Subduction Zone or propagating from distant Pacific sources represent the greatest threat. Within Puget Sound, dangerous tsunamis are more likely to be generated by local earthquakes and landslides. This work is being carried out at the Center for Tsunami Inundation Modeling Efforts, which is part of the Federal/State National Tsunami Hazard Mitigation Program.

The initial focus of the modeling in Puget Sound is the tsunami that was generated 1000-1100 years ago by an earthquake on the Seattle Fault. Paleotsunami evidence at West Point, Seattle, and Cultus Bay on Whidbey Island suggest the occurrence of this tsunami. Results from a high-resolution numerical model will be shown, indicating the areas around the Main Basin of Puget Sound that are most vulnerable to this type of tsunami. Future research will include the investigation of landslide-generated tsunamis and seismically generated seiching in lakes.

Influence of Intercepted Landslides on Nearshore Habitat

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In the natural landscape, Puget Sound coastal bluffs retreat episodically due to processes of landsliding and erosion. Sediment delivered to the beach by erosion is sorted and redistributed by waves and littoral currents, directly influencing the distribution of beach substrates and habitat types. Coastal armoring alters both the size and frequency of landslides into Puget Sound, affecting the rate and type of sediment deposition within the nearshore environment. Debris disposal often involves direct placement of soil and debris into the intertidal zone, waterward of the seawall or revetment. This approach is expedient and is often the least expensive alternative, but is often undertaken with minimal environmental scrutiny. The frequent use of emergency exemptions and the limited jurisdiction of state agencies on federally-regulated railroad operations often precludes rigorous environmental review, coordinated planning for impacts, and monitoring for effects on habitat. We show several examples of the influence of armoring practices on sediment delivery to Puget Sound and make recommendations for a program to enhance desirable habitat.

Earthquakes in Puget Sound: How Wild a Ride?

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Earthquake hazards assessments in Puget Sound are being revised upward. The new USGS estimates incorporate the recently recognized hazard from crustal faults. In 1992 earth scientists discovered shorelines on Bainbridge Island raised as much as 22 feet by an earthquake on the Seattle fault. This was the first time that the possibility of large magnitude (~7) crustal earthquakes in Puget Sound was seriously considered by the USGS. Since 1992 the USGS has focused geophysical and geological studies on the

crustal fault systems in Puget Sound. The results indicate that the hazard from crustal fault earthquakes dominate the earthquake hazards for most of Puget Sound.

The reason USGS earthquake hazard assessments are changing in Puget Sound is the availability of new data. Crustal faults are difficult to study in Puget Sound because they are covered by thick glacial sediments and heavy vegetation. The USGS has used a series of geophysical experiments, supplemented by new geologic mapping, LIDAR, and paleoseismic studies, to piece together new models of crustal fault behavior. These geophysical studies include a regional aeromagnetic survey, shallow marine seismic reflection, deep seismic imaging, and local seismic recording for site response studies.

Results from the improved models of Puget Sound faults have raised the seismic hazard assessments, particularly over the Seattle fault, S. Whidbey Island fault, and the Tacoma fault. The bottom line from these estimates: the ground shakes harder and more frequently in Puget Sound than we previously thought. The new hazard estimates may require stronger design standard for buildings in the area.